

NAVY MEDICINE

July-August 1989



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AND SURGERY

DEPARTMENT OF NAVY
NAVAL
MEDICAL
COMMAND

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COVER: VADM James A. Zimble, MC, Surgeon General of the Navy and Chief of the Bureau of Medicine and Surgery, displays the new sign at headquarters. After a 7-year absence, BUMED is back (see pages 8 and 10). Photo by HM2 Thomas C. Balfour, NSHS, Bethesda, MD.

BUMED:

"Back to the Future"

The Naval Medical Command (NAVMEDCOM) is gone and the Bureau of Medicine and Surgery (BUMED) is back. How did we get here, and what can the Medical Department expect from now on?

A year and a half ago I became a member of the Blue Ribbon Panel. After my fellow panel members and I reviewed the current status of Navy medicine and analyzed the initiatives we in the Medical Department proposed, the panel adopted 76 specific proposals that will improve the way we do business.

Key to the entire plan was the disestablishment of NAVMEDCOM and reactivation of BUMED. That event took place on 4 Aug 1989. As Chief of BUMED, I will maintain my office at 23rd and E Streets, N.W., Washington, DC. My main concerns will involve Navy and Marine Corps health care policy, and technical and primary support of our facilities. I will also monitor the quality of care provided to patients and will act as advocate for the professionals responsible for providing that care.

On 1 Oct 1989, the Geographic Medical Commands (GEOCOM's) will be disestablished and health care facilities will come under the military command of Navy and Marine Corps responsible line commanders. The introduction of line military authority and responsibility for our shore-based facilities should go a long way toward promoting a working partnership between the Medical Department and the line community. As a result, we will streamline our operation, our managers will be more responsive, and medical and line resources will be directed toward providing the finest health care to our Navy and Marine Corps family.

Even as I assume command of BUMED, one of my trusted colleagues and friends will be retiring after a distinguished 25-year Navy career. I would like to thank RADM Jim Sears for his loyal dedication and support. His able and steady hand on the helm as Commander of the Naval Medical Command steered us through turbulent waters. Thanks to his exemplary leadership, Navy medicine is headed in the right direction. I know I speak for the entire Medical Department in extending to him and his family our very best wishes for continued success and good fortune.

VADM James A. Zimble, MC

A look back: Navy medicine ca. 1908

BUMED Archives



Hospital ship USS Relief

Farewell

As you read this, the reorganization of the Medical Department is well underway and the Bureau of Medicine and Surgery has been established. My tour as Commander of the Naval Medical Command has been filled with challenges and a lot of hard work. The opportunity to serve has been very meaningful to me.

Increased resources have allowed Navy medicine to begin to flourish once again. The Blue Ribbon Panel, having completed its mission, is now a Standing Medical Board that will continue to monitor the revitalized partnership between the line and the Medical Department. As a result of that renewed commitment, the needs of the medical organization will be met and the entire Navy will benefit.

Health care professionals providing patient care should only see increased management effectiveness and efficiency. The revised chain of command and organizational streamlining going on in the upper echelons are designed to capitalize on the line Navy's expertise in obtaining needed resources. This will allow our personnel to do more of what they do best—provide quality health care.

As you enter the next decade, Navy medicine must continue to grow and adjust to a changing environment. Total quality management, catchment area management, and innovation will be required, not merely to keep up, but to enable Navy medicine to flourish and grow. The Navy's well-being depends on a healthy Medical Department.

Navy medicine has been very special to me, and I leave tremendously proud of our history and our people. Your magnificent performance under fire has reflected your mettle and dedication. It has been a rewarding and fulfilling career, and I thank all of you for your support and your friendship. I will miss you. Goodbye, good luck, and God bless you.

RADM H. James T. Sears, MC

Recognizing Our Best



HM2 Louis Curtis

From left: HMCM W.M. Griffith, HM1 Carmen A. Baker, HM1(AW) Craig A. Fitzgivens, DT1 Douglas E. Thomas, and MCPON Duane R. Bushey.

The Navy's selling point is teamwork, said DT1 Douglas E. Thomas, COMNAVMEDCOM's Sailor of the Year for 1989. "The way people get in there and work to accomplish the job is great," he said. "The Navy may not be more of a team effort than other companies, but it means more. In business, you're talking dollars and cents. In the military, it's human lives at stake."

The sailors who came to Washington 17-19 April as finalists for the 1989 COMNAVMEDCOM Sailor of the Year were quite an impressive team. Thomas, who flew in from Naples, Italy, as Naval Medical Command

European Region's 1988 Sailor of the Year, was joined by HM1 Carmen A. Baker, 1988 Sailor of the Year for Naval Health Sciences Education and Training Command, and HM1(AW) Craig A. Fitzgivens, Naval Medical Command Mid-Atlantic Region's Sailor of the Year for 1988. The trio had a whirlwind tour of Washington that culminated in an awards ceremony presided over by Force Master Chief HMCM W.M. Griffith, with letters of commendation presented by RADM H. James T. Sears, MC, Commander, Naval Medical Command.

In announcing COMNAVMEDCOM's Sailor of the Year, Sears said,

"The selection was a difficult task. Each individual nominated is an outstanding representative of their command and a superb ambassador for Navy medicine." He lauded the finalists and the 12 runners up, saying, "On behalf of all members of the Naval Medical Command, I extend a most sincere congratulations and best wishes to all nominees."

Among the finalists were many shared beliefs. In addition to teamwork, Thomas, Baker, and Fitzgivens also praised the Navy for the opportunities it has available, emphasizing the need for sailors to make the most of them. "There's not a door in the

Navy closed to you, unless you don't open it," said Baker.

Fitzgivens echoed the thought, saying, "The sky's the limit in the Navy, so any special program that you can get into, go for it." Fitzgivens also pointed out the importance of setting realistic goals on the road to success. "You've got to set your goals and follow through," he said. "Achieving short-term goals should move you along toward your long-term goal."

As a member of her Command Retention Team, Baker helps guide Navy people on the road to success by helping them develop their full potential. "I help them see opportunities and direct them in a career path," she said. "I encourage them to believe in themselves, set a goal, and keep going—to push for it."

In addition to providing guidance and leadership, Thomas emphasized the need for recognition. "Recognize your people," he said. "Let your people know you care, 'cause without them you're not going to go very far."

Thomas also pointed out that the Navy medical community has an abundance of good people, and the competition is stiff. Before the sailor of the quarter nomination that qualified him to compete for this year's sailor of the year, Thomas said it had been about 4 years since he was last sailor of the quarter. In that time, he never gave it less than his best.

"I want to say this to those who give it their all and don't get recognized: Don't give up. Keep in there. Keep giving it 110 percent," said Thomas. "You've just got to keep going. If you succumb to failure, you're never going to achieve. If you continue to strive, you will."

This was another common trait of the finalists—taking pride in knowing they always put forth their best effort in whatever task they undertook. And the Navy can take pride in them. □

Liz Noland, Public Affairs Office, Bureau of Medicine and Surgery, Washington, DC 20372-5120.

COMNAVMEDCOM 1989 Sailor of the Year

DTI Douglas E. Thomas
U.S. Naval Dental Clinic, Naples, Italy

COMNAVMEDCOM 1989 Sailor of the Year Finalists

HMI Carmen A. Baker
Naval School of Health Sciences, San Diego Detachment, Oakland, CA

HMI(AW) Craig A. Fitzgivens
Naval Hospital, Cherry Point, NC

COMNAVMEDCOM 1989 Sailor of the Year Nominees

DTI Anne M. Bright
Naval Medical Command, Washington, DC

DTI Clifford Clarke
National Naval Dental Center, Bethesda, MD

DTI Garrett H. Ebendick
Naval Dental Clinic Branch, Lemoore, CA

HMI William J. Hartmann
Naval Hospital, Orlando, FL

HMI Cyndee J. Hayes
Naval Hospital, Great Lakes, IL

HMI Richard R. Hogg
Navy Ophthalmic Support and Training Activity Yorktown, VA

HMI Gerald W. Lombardi
Environmental and Preventive Medicine Unit 6, Pearl Harbor, HI

HMI Anne E. Macker
National Naval Medical Center, Bethesda, MD

DTI(SW) Roland N. Manahan
Naval Dental Clinic, San Diego, CA

HMI Jeffrey B. Meekins
Naval Aerospace Medical Institute, Pensacola, FL

HMI Jeffrey C. Roth
Naval Hospital, Guam, Mariana Islands

HM2 Edwin E. Taylor
Naval Biodynamics Laboratory, New Orleans, LA

Miracle Baby 1 Year Later



JO2 T.S. Begasse

Elsa models the season's latest infant fashion.

A special, tiny blue-eyed "miracle" baby was born at Naval Hospital, Oakland, CA, 11 Jan 1988—Elsa Marie Gustafson. She weighed only 15½ ounces when she entered her new world and successfully challenged statistics to become the smallest baby to survive in the hospital's 46-year history.

Today, 18-month-old Elsa is a pint-size dynamo. She listens to classical music, travels to Lake Tahoe and the Olympic Peninsula, has attended a Shakespearean festival, and loves books. However, over a year ago, life was uncertain.

Elsa, daughter of LT Linda L. Gustafson, NC, USNR, and LCDR Walter A. Gustafson, USNR, was delivered by caesarean section, 14 weeks premature due to her mother's high blood pressure, excessive weight gain, and significant increases of protein levels, according to CDR David R. Field, MC, the head of the hospital's Obstetrics Division.

This condition, known as pre-

eclampsia, can progress very quickly into seizures, ruptured liver, and kidney damage. Gustafson's condition was severe and, if left unattended, both her life and the baby's would have been threatened.

The fetal heart tones were checked hourly. Growth had apparently stopped for Elsa, and the mother's amniotic fluid was diminishing. Surgery was called for and the doctors gave Elsa a 10 to 15 percent chance for life. "All our tests indicated she (Elsa) was dying and would have within the next 24 hours," said CDR Field. "I felt the baby had a chance and recommended a caesarean section."

During surgery LT Gustafson was anesthetized from the waist down. General sedation would have jeopardized Elsa even more. After the 45-minute surgery, Elsa gave a little cry and everyone in the operating room smiled.

The neonatology team led by CDR Lewis Otero, MC, head neonatologist, and LCDR Julian F. Keith III, MC,

assistant head neonatologist, immediately put Elsa on a ventilator to ensure breath. Elsa's strong will to survive was evident to all from that moment on. In fact, she moved so much the doctors had to sedate her for fear she would remove the taping and tubes from the ventilator and oxygen.

Elsa was immediately taken to the hospital's Neonatal Intensive Care Unit (NICU). Her first 24 hours were critical for preventing and detecting problems. The neonatologists and



Elsa, at 3 weeks old and about 14 ounces, recovers from surgery that corrected a lung problem.

NICU staff took aggressive measures to allow Elsa's body to recover, heal, and mature.

Along with the respirator support and oxygen, "she was kept in a neutral thermal environment to keep her temperature normal," explained Keith. "She was provided intravenous fluids she would lose through her very thin and gelatinous skin."

Elsa was smaller than the ultrasound had estimated her fetal weight to be, according to Field, attributing her growth retardation to the mother's preeclampsia. "The average weight for a 26-week gestation infant is 1,000 grams (about 36 ounces)," explained Otero. "Elsa's weight was 440 grams (15½ ounces), placing her weight way below what was expected for her age."

Elsa continued to make remarkable progress and was released from the hospital 2 May 1988. It was a day filled with joy and tears. "It's really been a lesson in the strength and resilience of the human spirit to watch Elsa go through it all," the father said. "She has really been an inspiration to so many people," the proud mother said as she looked at a picture of Elsa 2 days after she was born. "She is just so full of life."

A year later, Elsa still visits the hospital every 3 months for medical assessments. She was taken off oxygen just 2 months after going home and in that same month, her vital signs' moni-

tor was required only at night. Still under the watchful eyes of Drs. Otero and Keith, Elsa appears to be making great progress.

"She is doing amazingly well," said Otero. "Elsa has overcome the major complications usually experienced by babies of her circumstances, such as cerebral palsy, frequent pneumonia, and respiratory problems requiring extended amounts of oxygen." Other problems common to babies born extremely premature are developmental delay, physical handicaps, and even blindness. What's more, most require additional hospitalization—unlike Elsa.

In Elsa's case, she has experienced only a few minor problems according to her physicians. Her feet severely turned inward. This has been fully corrected through the use of feet braces. She also has weak muscles in her right eye—by wearing a patch on her left, the muscles are expected to strengthen fully in no time.

The only other problem faced by Elsa is a small hernia which, according to Otero, is causing no complications. "It is something common in premature babies and will be electively operated on in the near future," he said. As for sleeping and eating habits, Elsa is right on track. The only item her parents say she doesn't really like is dry spinach—but then, who does?

"We're very optimistic about Elsa, who's had a smooth course despite a rocky beginning," LCDR Gustafson maintained. "I hope when she's a teenager that we can somehow communicate to her what she went through and what a fight she put up. "It will be a part of her life forever—let's hope she can appreciate what she has done," he continued.

The doctors are just as optimistic. "I have very good hopes and feelings about Elsa's future," Otero emphasized. "She broke the statistics by surviving birth. She further broke the statistics by making it through the first 24 hours. And, she broke the statistics in terms of her development and growth today," described Keith. "Elsa's a very remarkable girl."

Since birth, Elsa has been closely followed by the hospital's High Risk Infant Clinic as well as Leapfrog—Parent Training for Infant Development, a Vallejo-based organization that educates parents, provides resources such as physical therapists and qualified babysitters and makes developmental assessments.

As for the parents, Elsa's dramatic beginning will always be a part of their lives; but they find it hard to believe life was so uncertain for Elsa when she plows through the house behind the wheel of her little red tot rod. "When she sets her sights on something, she goes right for it," says her dad.

And that she did. Elsa Marie Gustafson set her sight on life—and went for it!

Note: In the United States nearly 40,000 babies die each year before their first birthday. Of that startling amount, the largest group are infants born weighing less than 1,000 grams (about 36 ounces)—the "very, very low birth weight (VVLBW)" infant. These infants contribute only 1 percent of the total births, but account for 60 percent of the deaths occurring within the initial 28 days of life.

Now, for the sake of understanding, we must look at one more statistic—babies born weighing 500 grams (about 18 ounces) and less. According to medical research, these babies make up only 0.2 percent of total births; however, their mortality rate is documented as being 100 percent.

In fact, in 17 states in this country, a child born under 500 grams is not considered a live birth, according to a leading neonatologist at Childrens Hospital in Colorado.

Sources: Journal of the American Medical Association; Pediatrics, Vol. 80, No. 6; Clinics in Perinatology, Saunders, June 1986; Follow-up Management of the High-Risk Infant, D.W. Taeusch, M.D., and M.W. Yogan, M.D., 1987; and USA Today, 12 April 1988. □

—Story by JO2 Tammy Begasse, Public Affairs Office, Naval Medical Command, Northwest Region, Oakland, CA.

Gustafson family photo



Medical Department

The November-December 1989 issue of *Navy Medicine* reported on the results of the Blue Ribbon Panel (BRP) and what the findings would mean for the future of Navy medicine. One of the key aspects of the BRP's strategy for revitalizing Navy medicine was the reorganization of the Medical Department. This reorganization has strengthened line involvement and streamlined the management of the Navy's health care system. Some features include:

- Assignment of Navy shore-based hospitals and clinics to fleet Commanders-in-Chief (CINC's) or Commander, Naval Education and Training (CNET). The CINC's/CNET exercise control through the local Navy/Marine Corps base or station commander.
- Consolidation of Medical Department headquarters by reactivating the Bureau of Medicine and Surgery (BUMED), with the Surgeon General as Chief, BUMED, and disestablishing the Naval Medical Command.
- Establishment of five Healthcare Support Offices (HSO's) at Norfolk, VA; Jacksonville, FL; London, UK; Pearl Harbor, HI; and San Diego, CA; and establishment of a fiscal support office at Great Lakes, IL.
- Establishment of National Naval Medical Center in Bethesda, MD.

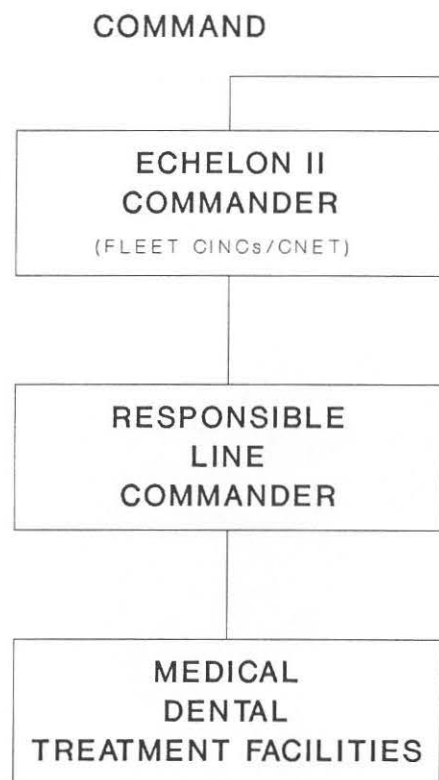
- Disestablishment of the eight Geographic Commands (GEOCOM's).
- Disestablishment of the four medical Clinics Commands.

Base commanders are now advocates for Navy and Marine Corps beneficiaries seeking access to the base's hospital or clinic, as well as for administrative and support needs of personnel at the treatment facility. The hospital or clinic commander will report directly to the base commander, who ultimately reports to fleet CINC's or CNET.

Chief, BUMED is the proponent for the quality of health care provided to the patient and for the professionals responsible for the patient's well being. BUMED now performs budget formulation and the execution; provides manpower, facilities and material; establishes clinical standards; and assures total quality management. The new organizational structure is displayed in the chart.

HSO's provide technical assistance to hospitals and clinics in health care delivery, quality assurance, resource management, and logistics support. The Great Lakes office has consolidated Navy claims processing for all active duty health care provided by the civilian sector. HSO's are located at sites of former GEOCOM's to take advantage of skilled personnel present

at the GEOCOM's and to minimize personnel actions. The reorganization was intended to have minimal impact on civilian personnel once employed at the GEOCOM's.



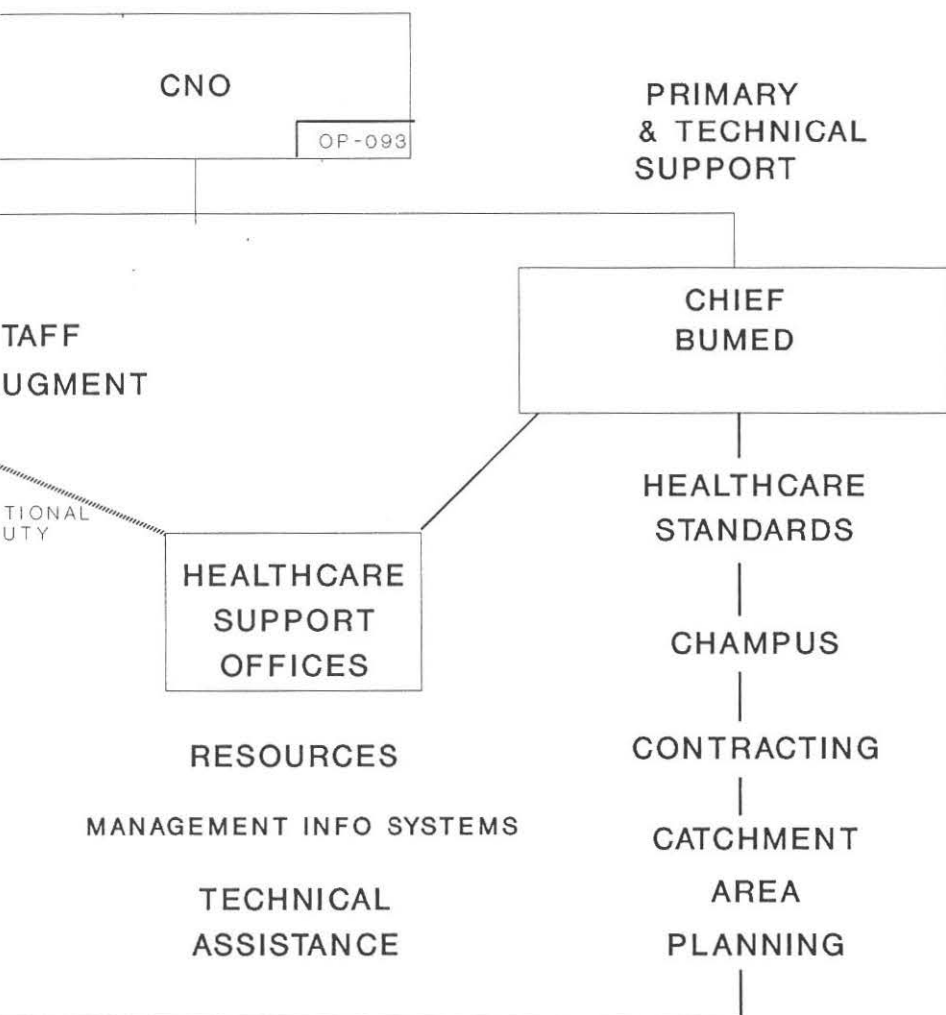
Reorganization

Thus we have embarked on a fundamental shift in Navy medicine management by placing a health care consumer advocate, in the person of fleet CINC's/CNET, directly into the

Navy's health care command structure. It has also streamlined the chain of command and returned critically needed experienced administrative personnel to hospitals and clinics. All

reorganization should be completed by October 1990.

The 76 specific issues cited in the BRP report are within the framework of six general conclusions.



- Navy medicine must focus on increasing its in-house capability through optimal use of existing Navy hospitals and clinics.
- Navy medicine will assign Graduate Medical Education (GME) top priority.
- Navy medicine will develop measures of rating its effectiveness.
- Every initiative to improve Navy medicine will be measured against cost-effective solutions.
- The Navy must document and communicate meaningful improvements in Navy medicine.
- The BRP and flag officer working group will be maintained to monitor and review implementation of mandated recommendations.

A special objective of the panel is to improve access to health care for all eligible personnel. To accomplish this, we will use, when necessary, innovative contracting, personnel hiring, and bold initiatives. The reorganization of the Medical Department will have significant impact on the way we provide health care. □

Welcome Back BUMED

On 4 Aug 1989, the Naval Medical Command ceased to exist. After a 7-year slumber, the Bureau of Medicine and Surgery (BUMED) awakened and revived. The reorganization recommended by the Blue Ribbon Panel and approved by the Secretary of the Navy is certainly not the first time the Navy Medical Department has changed its appearance. BUMED's very birth in 1842 grew out of a major reorganization of the Navy itself.

Creation

By the late 1830's, everyday administration of the Navy Department had become cumbersome and inefficient. The Secretary of the Navy was person-

ally performing many duties which could have been handled by clerks. There was no true division of labor among Navy Department employees or the Board of Navy Commissioners. Without a total reorganization of the Navy, business could no longer be carried out with the personnel then employed there.(1)

On 31 Aug 1842, Congress passed a Navy appropriations bill that was a blueprint for efficiency. The legislation provided for five bureaus to replace the Board of Navy Commissioners: Yards and Docks; Construction, Equipment, and Repair; Provisions and Clothing; Ordnance and Hydrography; and Medicine and Surgery. A Chief, appointed by the

President, headed each bureau. Chief, BUMED was selected from the Navy's cadre of surgeons. His salary was \$2,500 per year, the smallest amount for any of the new bureau chiefs. In fact, most chiefs, up to and including Presley M. Rixey (1902-1910), had to maintain active civilian medical practices to earn a living.

BUMED was the first central administrative organization within the Navy Medical Department, and the Chief of the Bureau and his assistant devoted their entire attention to supervising and managing the Navy's medi-





Photos from BUMED Archives

cal service. SECNAV granted BUMED jurisdiction over all Navy facilities concerned with the treatment of the sick and wounded. The General Order of 26 Nov 1842, which defined the duties of the bureaus, stated that BUMED was charged with:

All medicines and medical stores of every description, used in the treatment of the sick, the diseased and the wounded; all boxes, vials and other vessels containing the same; all diet for the sick; all clothing, beds and bedding for the sick; all surgical instruments of every kind; the management of hospitals, so far as the patients therein are concerned; all appliances of every sort,

used in surgical and medical practice, all contracts, accounts and returns, relating to these and such other subjects as shall hereafter be assigned to this bureau.(2)

Until the Civil War, the BUMED staff was small and consisted of the Chief, an assistant surgeon, two clerks, and a messenger. There was a division of labor among officers and clerks but specialization was not commonplace.

Even though authorized to delegate responsibility, SECNAV continued to practice what we now call "micromanagement." He personally appointed clerks and oversaw their efficiency. In

Above:

In August 1942, BUMED moved to its new headquarters, once the site of the U.S. Naval Observatory and later the Washington Naval Hospital and Naval Medical School.



William P.C. Barton served as the first Chief of BUMED.



William M. Wood, fifth Chief of the Bureau, became the first Surgeon General of the Navy in 1871.

October 1843, he went so far as to inquire why a clerk was "permitted to be absent from his duties so long and so often."⁽³⁾ On at least two occasions, SECNAV ordered Chief, BUMED to return to Washington to attend to his duties there.⁽⁴⁾

BUMED's most notable achievement in these early years was organizing the Medical Department's finances. Although the staff was small, it was adequate for performing business efficiently.

Civil War

The outbreak of the war in April 1861 saw a tremendous expansion in the Navy's size. As President Lincoln called for a blockade of southern ports, BUMED's heavy responsibilities to the fleet proceeded apace. The Bureau corresponded with about 420 stations and vessels in 1863.⁽⁵⁾ Correspondence with the Pension Office also increased. After 1 July 1861, certificates of death, ordinary disability, and

discharge were kept at BUMED instead of the Navy Department's main office. These records were bound, registered, and indexed; in October 1864, they filled 56 large volumes.⁽⁶⁾ The increase in paperwork was accomplished by a staff that numbered exactly what it had since the Bureau's founding in 1842: the Chief of the Bureau, assistant, two clerks, a messenger, and one laborer. It was "only by constant and unremitting industry that the work" was performed.⁽⁷⁾

BUMED's mission remained unchanged during the war. In 1863, SECNAV transferred authority over hospital buildings from the Bureau of Yards and Docks to BUMED. In his 1863 annual report, the Chief of the Bureau began submitting recommendations on construction of additional hospital buildings, repair of older hospitals, and the first estimates of what funds would be required for construction and repair of naval hospitals.

The Steel Navy (1881-1897)

The transition from sail to steam and the introduction of many new features of ship design affecting naval hygiene, resulted in a host of new problems for the Navy Medical Department, the most important being a pronounced lack of resources. In his 1882 annual report to SECNAV, the Surgeon General (Chief, BUMED became a dual-hatted position in 1871, when Surgeon William Wood received the additional title of Surgeon General) pointed out that appropriations for the Medical Department had been fixed arbitrarily without regard to the actual needs of the service or conformity to any standards whatever. Two years later, BUMED requested \$341,720 for operating the Medical Department; it received only \$139,220, less than 50 percent of its request. The following year, the situation went from bad to worse. The Bureau requested \$174,860 but received only \$74,460 to maintain the entire Medical Department.⁽⁸⁾

The New Navy

By 1883, in addition to the Surgeon General and his assistant surgeon, there were 11 civilian employees on board. Of these, one was Chief Clerk, a position not abolished until 1943; another civilian acted as Financial and Recording Clerk; seven were clerks, variously assigned; one was a messenger; and one a laborer. This organization remained essentially unchanged until World War I.

During the period 1860 to 1900, it often was customary to order certain medical officers to Washington for "special duty."⁽⁹⁾ These officers assisted the Surgeon General in special projects as attending physicians in the Navy Dispensary, as curators of the Naval Museum of Hygiene, and in other capacities. Even up to the eve of our entry into World War II, many Medical Department personnel, although officially on duty at the Naval Hospital/Naval Medical and Dental School, were performing Bureau functions much of the time. There was a constant effort to minimize the number of official Bureau assignments. The White House Physician responsibility (after 1900) and the Capitol Physician (after 1928) were hidden in assignments to the Navy Dispensary (after about 1900) or even the Presidential yacht.⁽¹⁰⁾

World War I

Beginning in World War I, BUMED's workload and responsibilities had grown to such an extent that by 1919 a major reorganization was necessary (see table, right).

The Interwar Years

The years following World War I called for more than mere administrative fine tuning for BUMED. The Dental Corps had emerged from the war with such greatly increased prestige and responsibilities that by 1921 the Dental Division was established. The new division, with a Dental Corps officer in charge, now supervised all administrative matters concerning the Dental Corps, including the assignment and transfer of dental officers,

the care of dental property, the supervision of reports and returns, the inspection of dental activities, and all related matters.

In 1923, BUMED added the Division of Planning and Publications. Besides its publication function, the new division prepared detailed plans for the conduct of the Medical Department in future conflicts. The division also concerned itself with defensive methods of chemical warfare, protecting submariners from gas contamination, and training flight surgeons. The youthful field of aviation medicine was also within the Planning Division's purview, as was the development of base hospitals and the equipping of hospital ships; devising a new system of examining recruits; studying the latest advances in field sanitation; maintaining and training an adequate reserve of medical officers, nurses, and hospital corpsmen to meet wartime contingencies; and providing medical support to the Marine Corps.

That landmark year, 1923, also saw the creation of an Administrative Division charged with general administrative matters, legislation, laws and

regulations, and with preparing administrative instructions in connection with new legislation. It was also responsible for all civilian personnel matters.

Other adjustments were made from time to time as the need arose. New sections were created to handle new functions and old sections were abolished as the Medical Department supported the peacetime Navy of the 1920's and 1930's.

World War II

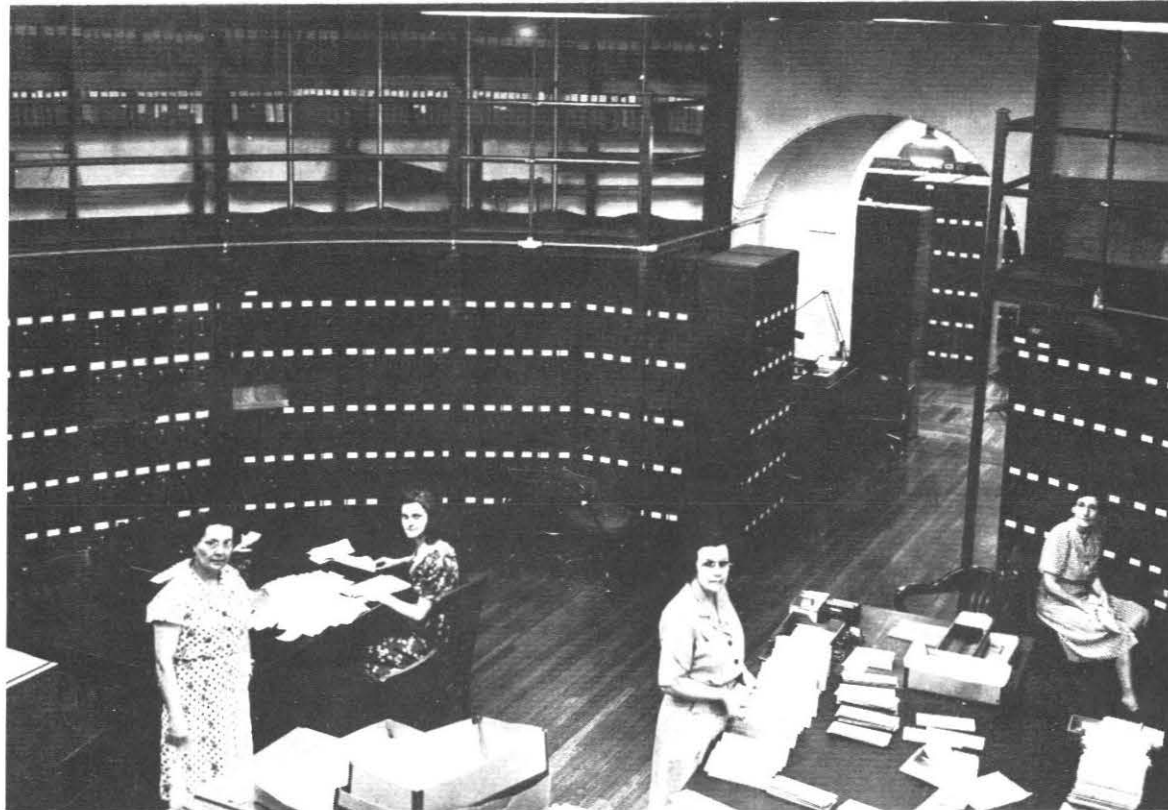
Prior to Pearl Harbor, the Medical Department's military employees numbered about 5,000 with several hundred civilians on the payroll.⁽¹¹⁾ By war's end, there were about 31,000 military and 13,500 civilian employees.⁽¹²⁾

This unprecedented expansion was reflected in the personnel picture at BUMED. Six months before Pearl Harbor the BUMED workforce totaled 362 military and civilian personnel. By 15 May 1945, these numbers had increased to an overall total of 1,188.⁽¹³⁾

BUMED's overall mission re-

Office of the Surgeon General
Officer Personnel
Hospital Corps
Nurse Corps
Physical Requirements
Health Records, Pensions, Promotions
Statistics
Sanitation
Naval Districts, Hospital Ships, Red Cross
Gas Defense
Publications
Requisitions
Bookkeeping
Correspondence Files
Mail Room
Pharmacist's Correspondence Course

**BUMED 1943: Hos-
pital Corps Person-
nel Jacket file room.**
World War II saw the
hiring of many addi-
tional civilian em-
ployees.



remained unchanged by the war. However, the Surgeon General's additional duties, such as speaking engagements, answering correspondence, defending the Medical Department against unwarranted attacks, etc., without losing sight of the mission of the Medical Department, were sufficient to tax the abilities and capacities of any man.⁽¹⁴⁾

In 1942, Congress approved legislation abolishing the Chief Clerk's position. That position acted in the absence of the Surgeon General. To replace that function, the Division of Administration was created. SECNAV then designated the heads of the Divisions of Inspection, Personnel, and Planning to take precedence, in that order, to function as Chief of the Bureau in the Surgeon General's absence.

By the close of the war, BUMED had settled into 14 divisions: Personnel, Administration, Planning, Preventive Medicine, Professional, Physical Qualifications and Medical Records, Aviation Medicine, Research, Finance, Materiel, Dentistry, Medical Statistics, Publications, and the Office of Assistant to the Surgeon General for Inspections.

Postwar

With rapid demobilization and shrinking appropriations, all Navy bureaus underwent reorganizations beginning in 1946. The key to this process was the "Top Management" policy. This new policy (General Order 230) affected BUMED's reorganization. The top management of the Bureau would consist of the Surgeon General (Chief of Bureau) and the following officers who would report directly to him and assist him in the performance of his top management functions:

- Deputy and Assistant Chief of Bureau
- Assistant Chief for Professional and Personnel Operations
- Assistant Chief for Planning and Logistics
- Assistant Chief for Aviation Medicine and Medical Military Specialties
- Assistant Chief for Dentistry

At this time the letter system of designation of units in the Bureau was changed to a number system, which in 1946 became the Code (number) system now in use.

During World War II there were

constant changes, many which never appeared officially in an organization plan. Special projects were initiated and dropped, often without special notice.

By 1 Dec 1946, the process of demobilization had run its course, the BUMED reorganization was complete and, for the most part, the Medical Department had resumed its normal peacetime activity.

What "normalcy" was for BUMED, however, was a reflection of what demobilization really meant. At its peak strength on 1 July 1945, the Medical Department had 13,722 Medical Corps officers, 6,447 Dental Corps officers, 2,212 Hospital Corps officers, 11,086 Nurse Corps officers, and 130,252 pharmacist's mates. Exactly 1 year later, the overall strength had dropped to 6,606 Medical Corps officers, 1,915 Dental Corps officers, 1,207 Hospital Corps officers, 4,459 Nurse Corps officers, and 48,118 hospital corpsmen, a loss of 101,414 in personnel strength in 12 months.⁽¹⁵⁾

Although the BUMED organizational structure did not change significantly from 1946 to 1950, the drastic cutback in Medical Department personnel could not help but affect the

manning at BUMED. By June 1950, when North Korean aggression plunged the United States into another overseas conflict, the Medical Department was hardly prepared.

During the 5 years following World War II, the Medical Department's strength was gradually reduced from a force of 170,000 to slightly more than 21,000 by June 1950. Although the BUMED organizational structure changed little during the crisis, great emphasis was necessarily placed on recruiting, recalling Reserve components to active duty, training, augmenting existing treatment facilities, and reactivating facilities dismantled following the Japanese surrender.⁽¹⁶⁾ Additional civilians and military personnel were brought to BUMED to help handle the load.

1955-1965

There were several proposals to consolidate the medical services of the Army, Navy, and Air Force in 1947, 1955, and again in the 1960's. Each time BUMED responded with extensive facts and arguments to show that the proposed consolidation would not produce economy and might, in fact, reduce the Medical Department's effectiveness. Action on these proposals was never taken. However, organizational changes in the Navy alone did

not substantially change the BUMED structure but altered its relationship to other naval bureaus and offices.

BUMED's organization remained relatively stable even though several new divisions appeared, and new recognition was given the enhanced importance of the Medical Service Corps when it received divisional status in 1955.

1965-1982

During the Vietnam era (1965-1973) BUMED's mission remained unchanged—to provide health care to sailors and marines. As with other conflicts BUMED adjusted in size to accommodate the needs of the Marine Corps and the fleet.

By the mid-1970's, with the Bureau back on a peacetime footing, other "adjustments" were required. Over the years the dependent and retired side of the equation had grown larger as had the Medical Department's size. In 1978, naval hospitals over a specified size and patient population became Naval Regional Medical Centers but still came under the direct supervision of Chief, BUMED.

Naval Medical Command

On 1 Oct 1982, BUMED, the last of the original Navy bureaus, was "restructured" the Naval Medical Command. Even though BUMED, established through the 1842 congressional act, remained on the books, as did the title Chief, BUMED, for all practical purposes, the old Bureau of Medicine and Surgery ceased to exist. The Surgeon General was still the Surgeon General but in addition acquired the title Director of Naval Medicine as a staff member of the Chief of Naval Operations (CNO). On CNO's staff, he was in charge of policy planning for the Medical Department. Policy implementation and technical proce-

dures became the responsibility of the Commander, Naval Medical Command. Under the old BUMED system, single offices were responsible for both development and implementation of policy and plans.

The "field" was also restructured. Individual hospitals and field activities now reported directly to geographical commanders and not to Chief, BUMED. Those GEOCOM's in turn reported to the Commander, Naval Medical Command.

This realignment, as it was called, changed the complexion, but not the mission of the Navy Medical Department. That mission, as defined by the Blue Ribbon Panel, which breathed new life into the Bureau of Medicine and Surgery, is to provide high quality medical care for the Navy family.—JKH

References

1. *Report of the Secretary of the Navy, 1841*, pp 356-357.
2. *Circulars and General Orders, No. 2, 1842-1865*, Department of the Navy.
3. David Henshaw to WPC Barton, 2 Oct 1843, in *Letters to the Heads of Bureaus*, 10 Sept 1842-26 July 1849.
4. AP Upshur to WPC Barton, 11 Jan 1843; David Henshaw to WPC Barton, 19 Dec 1843, *Letters to Heads of Bureaus*, Department of the Navy, 10 Sept 1842-26 July 1849, pp 23, 126.
5. *Annual Report of the Secretary of the Navy, 1863*, p 1065.
6. *Annual Report of the Secretary of the Navy, 1864*, p 1188.
7. *Ibid.*, p 1188.
8. Unpublished manuscript in BUMED Archives.
9. *Ibid.*
10. *Ibid.*
11. *U.S. Navy Medical Department Administrative History 1941-1945*, vol 2, p 18.
12. *Ibid.*, p 18.
13. *Ibid.*, p 18.
14. *Ibid.*, p 20.
15. *The History of the Medical Department of the United States Navy, 1945-1955*, NAVMED P-5057, Bureau of Medicine and Surgery, p 17.
16. *Ibid.*, p 16.

□



Surgeon General VADM Ross T. McIntire, MC (1938-1946), presided over the largest Medical Department mobilization in BUMED's history.

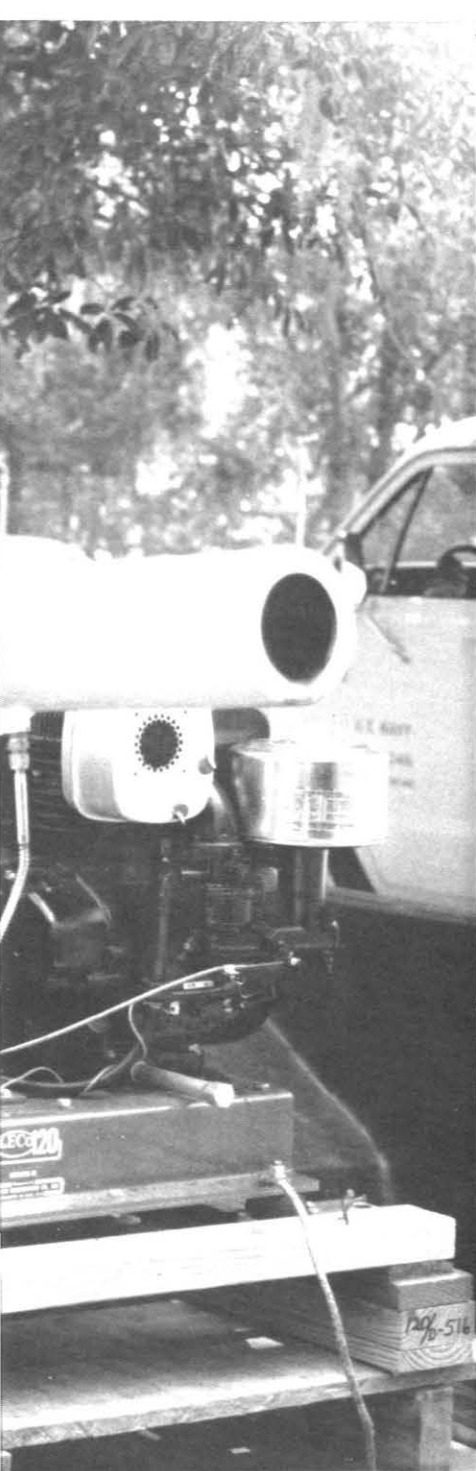


40 Years of Navy Medical Entomology

LCDR Mark T. Wooster, MSC, USN

July 1, 1989 marks the 40th anniversary of the Navy Disease Vector Ecology and Control Center (DVECC), Jacksonville, FL.* Over the years DVECC has gained international recognition from the World Health Organization, the Pan American Health Organization (PAHO), U.S. Aid for International Development, and many foreign

*See "U.S. Navy Medicine Visits Disease Vector Ecology and Control Center, JAX," *U.S. Navy Medicine*, August 1982.



Photos by LT Stanton E. Cope, MSC, USNR



Left: Proper equipment maintenance and calibration is necessary for efficient mosquito control. **Above:** Treatment of vegetation helps reduce the numbers of biting arthropods. **Below:** DVECC personnel frequently inspect food service facilities for cockroaches.



nations for its pioneering efforts in the survey and control of vector-borne diseases. Official recognition has also been repeatedly received from the Centers for Disease Control (CDC), U.S. Department of Agriculture, and from various DOD activities (including a Meritorious Unit Commendation) for DVECC's outstanding expertise and service in public health entomology.

DVECC JAX was the Navy's first unit dedicated to the prevention and control of arthropod-borne diseases (a

sister unit, DVECC, Alameda, CA, was officially opened in 1958). The Center is a field activity of the Bureau of Medicine and Surgery, Washington, DC, under the command and support of the Navy Environmental

Health Center, Norfolk, VA. Its mission is to provide comprehensive entomological support to the Navy and Marine Corps operating forces and shore facilities to protect health, maintain morale and efficiency, prevent



Dipping for mosquito larvae is part of a good surveillance program.



property loss, and preserve environmental quality.

DVECC JAX can trace its beginning to specialized units designed to control medically important arthropods in support of the Armed Forces during World War II. The actual foundation of the current activity, however, was laid in November 1947, when a vector control research program was established at the Medical Department, Naval Air Station, Jacksonville. This activity was authorized by the Secretary of the Navy on 10 March 1949, and was officially established on 1 July 1949 as the U.S. Navy Malaria and Mosquito Control Unit No. 1, headed by an officer in charge. This unit was placed under the military command of the Commandant, Sixth Naval District and under the management control of the Bureau of Medicine and Surgery. On 12 Nov 1952 the unit was redesignated the U.S. Navy Preventive Medicine Unit No. 1 (PMU 1); however, it still maintained its original mission.

In 1957 PMU 1 was renamed the Navy Disease Vector Control Center to recognize its unique mission and function. The Center's mission was expanded, and its area of responsibility (AOR) extended to include all of South and Central America, Europe,

Africa, and Southwest Asia.

In 1971, to reflect the Navy's deep concern for the safe use of pesticides and the world's ecology, the Center was redesignated the Disease Vector Ecology and Control Center.

On 25 Jan 1978 DVECC moved into its present facility at NAS JAX. A modern 17,000-square-foot building, it contains administrative offices, classroom space, laboratories, insectary, equipment test shop, warehouse, and pesticide formulation areas.

DVECC's overall mission is diverse and includes operational support to both fleet and shore units, training, testing and evaluation of vector control equipment and techniques, and medical entomology information processing.

Operations

The Operations Department of the Center is directly involved with arthropod vector surveillance and control. This is of vital importance because our deployed forces are increasingly threatened by a worldwide resurgence of malaria, dengue, and a variety of other arthropod-borne diseases. As a designated Mobile Medical Augmentation Readiness Team (MMART), the Center's Vector Control Team is on call 24

hours a day for disaster relief or augmentation to the Fleet Marine Force.

Fleet programs by the Operations Department primarily target the ubiquitous German cockroach and a variety of food-destroying stored products pests. Continuous efforts are made to test new pesticides and update pest management strategies. Hydramethylen ("Combat") bait stations are the latest in a long line of commercial products that have been tested and approved for shipboard use.

Support is also provided to shore activities. In cooperation with NAVFACENGCOM, shore station pest management programs are periodically reviewed to monitor each activity's mosquito surveillance efforts, safety programs, and emergency vector control plans.

The following is a list of operational highlights from the last 40 years:

- In 1951, a catastrophe-aid team provided the only organized fly and rodent control services during the great Kansas City Flood, within 24 hours of receiving the request for assistance.
- The first survey of the Caribbean for disease-bearing insects and rodents was conducted in 1953. Surveys are repeated periodically, most recently in June 1989.



Students learn how to identify medically and economically important arthropods.

duction into the United States of this potential vector of dengue.

Training

The backbone of the Center has always been training. The Center offers a wide variety of instruction including an EPA-approved, 4-week Pesticide Applicator Certification course for DOD personnel and a popular 2-week Operational Entomology Training course which poses problem scenarios for students in both the classroom and a 5-day field exercise. There is also a 2-week introductory course in Medical Entomology and Pest Management Technology for reservists. Over the years more than 10,000 students have received training at this Center from all branches of service and several foreign countries. The Training Department has also been responsible for a variety of publications including:

- *Recommendations for Chemical Control of Disease Vectors and Economic Pests* which was first published in 1967 and has gone through six editions. It was expanded and the format was changed in 1975 to the popular *Pocket Guide to Pest Management*.
- *Emergency Medical Treatment for Acute Pesticide Poisoning* wallchart which was first published in 1962. It has been periodically updated and revised with a new edition due out in July 1990.

Testing and Evaluation

The Center has always been a pioneer in vector research and in the development, testing, and evaluation of vector control equipment. Notable highlights include:

- In 1953—developed a rotary nozzle system for fixed-wing aircraft.
- In 1955—initiated ongoing insecticide resistance and light trap studies.
- In 1959—developed the HIDAL (Helicopter Insecticide Dispersal Apparatus, Liquid) followed in 1962

by a design suitable for high performance, fixed-wing jet aircraft.

- In 1965—designed, developed, and received approval from NAVAIR-SYSCOM for the PAU-9—Pesticide Aerial Unit, Ultra Low Volume (ULV) system for helicopter use.
- In 1975—outlined the military testing requirements for pesticide dispersal units for use by the Armed Forces.
- In 1980—began evaluating ground equipment for the Armed Forces Pest Management Board.
- In 1988—developed a rotary-head ULV helicopter system that is compatible with the PAU-9 system.

Medical Entomology Information

From the very beginning the Center has been a repository for a large volume of literature on the entomological aspects of vector-borne disease. This resource, plus the broad-based experience of the staff, has contributed to this Center's becoming a clearinghouse for medical entomology information. This information dissemination program was formalized in 1984 under the Navy Preventive Medicine Information System (NAPMIS) and has resulted in the development of Vector Risk Assessment Profiles (VECTRAPS). VECTRAPS are summaries of vector-borne disease for each of the 120 countries in the Center's AOR with recommendations for prevention and control.

The tremendous success of DVECC JAX can be attributed to the time and effort given by the officers, enlisted, and civilians who have been stationed here throughout the last four decades. Their dedication, pride, and professionalism have made this internationally recognized Center what it is today. □

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- In 1964 a disaster relief team was dispatched to Houston, TX, to assist with control of an outbreak of St. Louis encephalitis which resulted in over 470 cases and three deaths.
- In 1965 an initial aerial pesticide dispersal program was set up by Center personnel in the Republic of Vietnam.
- In 1979 PAHO requested assistance from the Center in support of relief efforts in the Dominican Republic following Hurricane David. Subsequently, a PAHO committee met at the Center and produced a manual on *Emergency Vector Surveillance and Control*. The Center received the Meritorious Unit Citation for this effort.
- In 1983 two separate MMART teams were deployed in support of the peace-keeping mission in Beirut, Lebanon.
- On several occasions from 1977 to 1989 Center personnel have provided special assistance for the control of dengue in Puerto Rico. Most recently, in February 1989, a request came via the CDC from the Governor of Puerto Rico.
- In 1986 the Center initiated an *Aedes albopictus* (Asian Tiger Mosquito) surveillance program at naval activities throughout eastern CONUS and the Caribbean following the intro-

Treating the Enemy

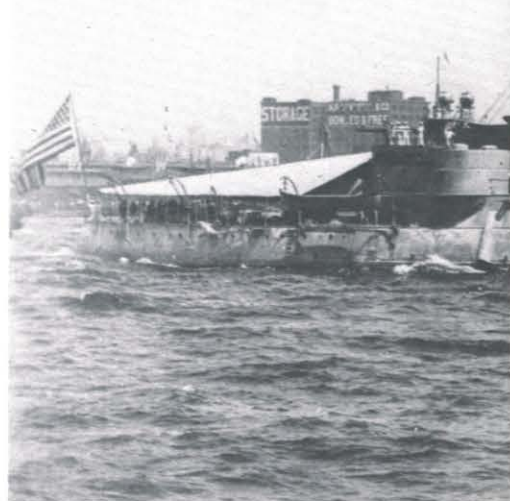
Santiago, Cuba, 1898

The Battle of Santiago, Cuba, was an overwhelming and lopsided naval victory for American forces in the Spanish-American War. Over 500 Spanish were killed or wounded during this decisive battle on 3 July 1898.⁽¹⁾ The entire Spanish fleet, under Admiral Pascual Cervera, was destroyed, and the wounded were taken prisoners. In contrast, the American forces reported only one death and 10 wounded, and no ship received serious damage.⁽²⁾ In fact, during the entire "Splendid Little War," there were approximately 400 Americans killed in action, less than 20 of whom were Navy—con-

Spanish sailors pose at Naval Hospital, Portsmouth, NH, following their capture at Santiago, Cuba.

siderably fewer casualties for the United States than for Spain.^(3,4)

Although the Navy exploited the Spanish forces in battle, they showed mercy in the aftermath. The Navy took pity on the defeated opposition, as men on USS *Iowa* and other members of the Atlantic Fleet risked their lives to save numbers of the wounded from burning ships and the sea. As the men on USS *Texas* greeted the Spanish surrender with cheers, Captain Phillip of that ship rebuked them, "Don't cheer, boys; the poor devils are dying."⁽⁵⁾ Admiral William T. Sampson of the *Iowa* wrote, "This rescue of prisoners, including the wounded from the burning Spanish vessels, was the occasion of some of the most daring and gallant conduct of the day. No risk deterred our officers

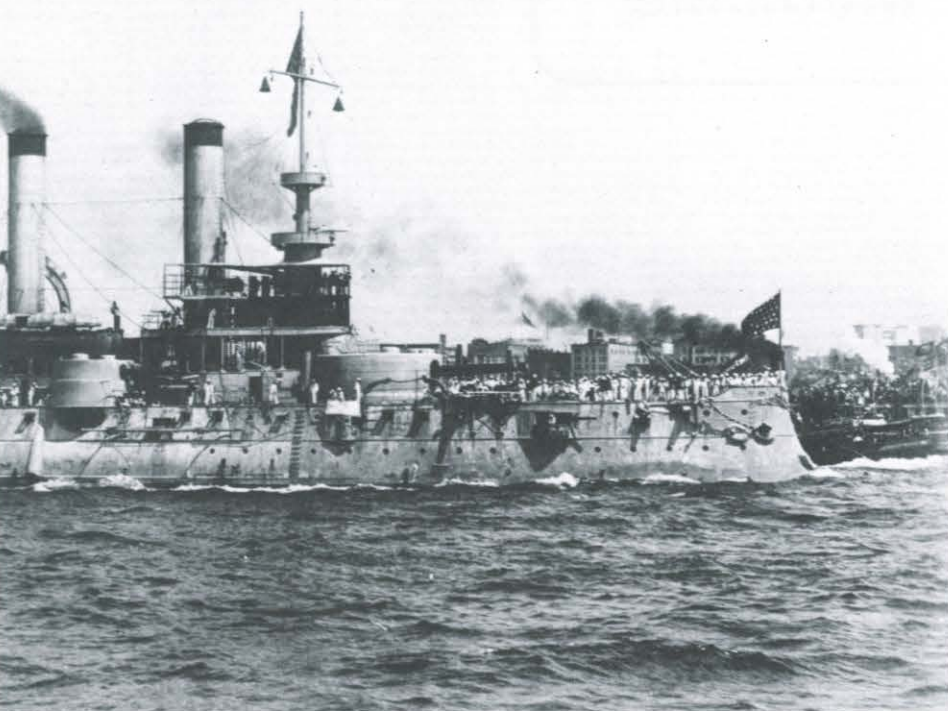


and men until their work of humanity was complete."⁽⁶⁾

The Navy treated the Spanish prisoners of war, including Admiral Cervera, aboard USS *Iowa*. The POW's were naturally frightened as

BUMED Archives





Naval Historical Center

USS Iowa (BB-4) triumphantly enters New York Harbor on 20 Aug 1898 following the Battle of Santiago.

they arrived on board, but soon were at ease with the compassionate American doctors treating them. M.H. Simons, a surgeon aboard *Iowa*, wrote, "When the first Spanish wounded were brought into the sickbay they resisted violently, evidently fearing that they would be tortured; but when they found that their wounds were carefully dressed, drugs given to soothe their pain, and clean clothes and mattresses or hammocks given them to rest on, they would cry, and pat our hands, and say 'good Americans,' over and over again."⁽⁷⁾ Maladies treated included wounds, malarial fever, dysentery, and exhaustion. The doctors worked with little rest until all the prisoners were cared for.

The Navy transported 53 severely wounded POW's to Naval Hospital, Norfolk, VA, on the U.S. ambulance ship *Solace*, with six wounded dying in transport.⁽⁸⁾ Surgery on *Solace* included ampu-

tation of arms, legs, and fingers, and resection of various bones. Wounds also received further treatment, although infection was present in most cases. This was attributed to the long time lapse between reception of injury and primary dressing. The doctors worked diligently for long hours to help the wounded.

The Navy sent the remaining prisoners on *Iowa* north, transporting them on *Harvard* and *St. Louis*. These men were not severely wounded. Slightly injured or uninjured officers, including Admiral Cervera, were interned at the U.S. Naval Academy. The Navy sent the remaining men to Seaveys Island, Portsmouth, NH.

The POW's again received medical treatment during their imprisonment. Navy doctors treated 1,023 of the 1,681 POW's located at Portsmouth, with 272 admitted to the hospital.⁽⁹⁾ Remittent fever, caused by a malarial infection, was

the cause of 27 of the reported 30 deaths there.⁽¹⁰⁾

At the Naval Academy, there were no deaths reported with 45 POW's admitted to the sicklist.⁽¹¹⁾ By the time of discharge from imprisonment, only one remained on the list.⁽¹²⁾ The main ailments at the Naval Academy were infection of wounds and malarial fever.

Three of 47 POW's died at Norfolk.⁽¹³⁾ This is a very low figure, considering all the POW's treated there were severely injured. One death each was caused by typhoid fever, complication from an amputation, and shock.

With an armistice signed on 12 Aug 1898, the Spanish POW's were released from custody on 8 Sept. The men returned to Spain on the steamship *City of Rome*, having the Navy doctors to thank for their recovery. In a time of war, these prisoners were nursed back to health, owing forever gratitude to the men who rescued them and the doctors who treated them. Many Spanish POW's owed their lives to the merciful enemy.

References

1. *Encyclopedia Britannica*. Chicago, Encyclopedia Britannica Inc, 1958, vol 21, p 152.
2. *Ibid.*, p 152.
3. *Ibid.*, p 152.
4. BUMED Archives.
5. Morris C: *The War With Spain*. Philadelphia, JB Lippincott Co, 1899, p 281.
6. *Ibid.*, p 281.
7. *Annual Report of the Surgeon General, U.S. Navy*, 1899, p 115.
8. *Ibid.*, p 39.
9. *Ibid.*, p 40.
10. *Ibid.*, p 40.
11. *Ibid.*, p 40.
12. *Ibid.*, p 40.
13. *Ibid.*, p 40.

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Payoffs of Navy Medicine



Navy Medicine and Tetanus

It began as the tiniest cut, accidentally inflicted while stropping a straight razor during morning shaving rites. Replacing the skin on the end of his ring finger, the young man applied a bandage and paid no more attention to it for several days. A week later, even as the bandage was removed, he noted strange sensations and acute pain in all parts of his body. The following morning he awoke complaining of a stiffness in his jaws. Soon the muscles that controlled chewing began to lock. The invisible poison spread, attacking the arm and leg muscles and finally his diaphragm. Breathing became more difficult and now, even with his terrifying demise a certainty, the man's mind remained amazingly lucid; he was condemned to witness the inevitable last stages of his disease.

John Thoreau died of tetanus on 11 Jan 1842. That the brother of writer Henry David Thoreau succumbed to lockjaw was not unusual. Tetanus, the



Photos from BUMED Archives

USS Relief on station during the Pacific campaign of World War II. Back in 1934 the first large-scale experimental tetanus trials took place aboard the hospital ship. Far left: Men of USS Nevada get their tetanus and yellow fever shots enroute to Iwo Jima, March 1945.

acute infectious disease caused by the tetanus bacillus toxin was a common and always fatal disease before scientists developed an antitoxin during World War I.

At the beginning of that war tetanus killed between 80 and 90 percent of its victims. On the Western Front the German armies averaged a 75 percent mortality rate. The British fared better with 50 percent mortality from the dread disease. These alarming death rates remained high despite the introduction of a new tetanus antitoxin because it was only *after* a soldier was wounded that he was inoculated. By then the tetanus bacillus had been given an opportunity to get a head start.

After the war, Georges Ramon, having developed a successful diphtheria immunization at the Pasteur Institute in Paris, moved on to create an even safer and more effective tetanus antitoxin than had been employed during World War I, one that could immunize

entire armies *before* soldiers were injured.

It was not, however, until 1934 that large-scale development of tetanus toxoid began in the United States. What inhibited the work was an adequate control population that could be mass tested with tetanus antitoxin.

The first experimental tetanus trials took place on the U.S. Navy hospital ship *Relief* in June 1934 under the direction of CDR W.W. Hall, MC. Hall sought the ideal method of injection, the proper interval between injections, and the number of injections required for successful immunization.

Dr. Hall found that the new alum-precipitated toxoid he used was a far more efficient agent than the older versions. By 1937 his results with the small *Relief* test group were so promising that the Navy Medical Department dispatched him to the Naval Academy at Annapolis to test the antitoxin on a much larger body of volunteers. There he teamed up with CAPT R. Hayden,

MC, the Annapolis Naval Hospital's senior medical officer. A year later the two researchers were granted permission to inoculate the student body of 2,300 men.

Hall and Hayden then obtained enough toxoid from a commercial pharmaceutical company to immunize the entire test group, the largest batch of toxoid yet produced in the United States.

Although all the test subjects showed immunity in their blood samples, too many men demonstrated mild reactions, from sore arms to slight fevers. The second round of injections 8 weeks later yielded five times the number of reactions.

When a new batch of toxoid was used to inoculate a new test group of 500 men, no reactions were reported, indicating that the very first batch of toxoid had been defective. It had not been washed correctly in the manufacturing process and undesirable amounts of blood serum proteins remained behind.

In the future all batches of tetanus toxoid would be routinely tested for purity by a simple procedure developed by another member of the Navy Medical Department, Chief Pharmacist's Mate P.S. Gault. With the Gault test, Drs. Hall and Hayden, the Navy, and the rest of the medical community were assured that tetanus toxoid was both safe and 100 percent effective. Periodic immunization of armed forces personnel became routine as the United States entered World War II. As a result, not a single combat casualty in the Navy and Marine Corps developed tetanus during that conflict. Because of the pioneering work carried on in the Navy Medical Department no one need ever again fear the dreaded lockjaw.—JKH

When the Cough Doesn't Get Better

LCDR Ronald Paul Sen, MC, USNR

The six cardinal manifestations of respiratory disease are cough, chest pain, dyspnea, hemoptysis, wheezing, and sputum production. The importance of cough lies in its frequency, its potential to signal underlying disease (which may be either life-threatening or communicable), and its disruption of either the patient's or others' activities. Infrequently, cough per se can cause potentially serious injury to the patient. This article briefly reviews an approach which the primary care practitioner can use "when the cough doesn't get better."

Cough is a reflex, although it also comes under voluntary control. The cough reflex helps to prevent lung injury from mechanical forces (overdistension) and physical irritants, including infectious and noninfectious particles, chemicals, and gases.⁽¹⁾ Cough may either prevent their access into the subglottic airway or limit their penetration into the gas exchanging portions of the lung. Cough is mediated by cough receptors (which can be distinguished from receptors for bronchoconstriction), afferent nerves, a poorly localized "cough center," and efferent nerves to the respiratory muscles.

Following an inspiratory effort (voluntary or involuntary), the glottis closes briefly (.2 seconds), allowing intrathoracic pressure to rise, followed by glottic opening and expulsion of air. The cough apparatus is designed to create high flows through a narrow orifice (airways undergo dynamic compression from high pleural pressures) resulting in the linear velocity and shearing forces necessary to clear central airways.⁽²⁾

Cough receptors exist throughout the upper airways and the central airways (particularly the first four generations), as well as the tympanic membrane, external auditory canal, pericardium, and diaphragm. Accordingly, cough may indicate disease at numerous sites within the respiratory system. Unfortunately, cough connotes little diagnostic specificity.

Common causes of chronic cough are listed in Table 1. A systematic approach (Table 2) allows the clinician to diagnose and treat most patients with chronic cough. History, physical examination, radiographic assessment, spirometry, and empiric therapy may be diagnostic. Selected patients will require referral for specialized diagnostic investigation, such as fiberoptic bronchoscopy.

History

The most common cause of chronic cough is cigarette smoking (chronic bronchitis). Half of pack-a-day smokers report cough.⁽³⁾ Worsening cough in a cigarette smoker should prompt consideration of tracheobronchial neoplasm. Patients with the onset of cough following a typical upper respiratory infection suggests postinfectious bronchial hyperreactivity resulting in cough with or without wheezing.⁽⁴⁾

Postinfectious cough may persist for several months. Although controversial, postnasal drainage is associated with chronic cough.⁽⁵⁾ Irwin and colleagues⁽¹⁰⁾ demonstrated that prolonged decongestant therapy (2 months) may alleviate cough in this setting. Asthma may present as chronic cough. Corrao and colleagues originally described

six patients with this entity.(6) Symptoms on exposure to cold air or with exercise may be clinical clues. Esophageal reflux is associated with cough, presumably through reflex vagal stimulation.

Although a history of heartburn need not be present, inquiry into its presence is mandatory. Many drugs can produce pulmonary toxicity. Several commonly used agents have cough as an important side effect. Nitrofurantoin may produce cough and dyspnea. Pulmonary infiltrates, angiotensin converting enzyme (ACE) inhibitors may cause cough in patients with bronchial hyperreactivity.(7) Beta-blockers may effect cough and bronchospasm in patients with obstructive lung disease. Comprehensive discussion of drug-induced lung disease is available in a recent review.(8)

Occupational or avocational inhalation of environmental agents may also produce cough through occupational asthma or hypersensitivity lung disease. The physician should inquire into details of the patient's job, exposure to hazardous materials, or exposures off the job (e.g., pets, humidifiers). Cough accompanied by lithoptysis (spitting of stones) is virtually diagnostic of broncholithiasis, usually from prior tuberculosis or histoplasmosis.

Complications of Cough

Patients may seek attention because of cough or secondary effects of cough. Cough may result in minimal or severe physical or emotional distress. Increases in intrathoracic pressure may create barotrauma, resulting in pneumothorax, pneumomediastinum, or pneumoperitoneum. The combination of increased intrathoracic pressure, decreased venous return, and increased intracranial pressure may diminish cerebral perfusion pressure causing cough syncope.

Complications of Cough

Cough may cause soft tissue injury resulting in pain, with or without fractures. Stimulation of the pharynx can produce vomiting. I have cared for one patient whose intractable cough from pulmonary eosinophilic granuloma resulted in medical separation because of inability to participate in unit activities, and another patient was unable to seek employment until her cough had been diagnosed and treated.

Physical Examination

Physical examination infrequently yields diagnostic information from chronic cough. Rarely, hairs, cerumen, or foreign material in the external auditory canal stimulate "Arnold's branch" of the vagus nerve to produce cough. Pharyngeal exudate or "cobblestoning" has been seen in the patients with chronic rhinosinusitis. Basilar "velcro" rales suggest chronic interstitial lung disease. Endobronchial obstruction with benign or malignant tumors occa-

TABLE 1
Common Causes of Chronic Cough*

| |
|--|
| Chronic bronchitis (tobacco) |
| Postinfectious bronchial hyperreactivity |
| Chronic rhinitis |
| Asthma |
| Gastroesophageal reflux |

*Cough greater than 3 weeks

TABLE 2
Approach to the Patient With Chronic Cough

Primary

| |
|--|
| History |
| Physical examination |
| Radiography (chest, sinus) |
| Spirometry (methacholine inhalation, if necessary) |
| Empiric therapy |

Secondary

| |
|--|
| Otolaryngology consultation |
| Fiberoptic bronchoscopy |
| Esophageal pH monitoring |
| Thyroid scintigraphy |
| Computed tomography (broncholithiasis) |

TABLE 3
Diagnostic Criteria for Methacholine Inhalation¹⁵

| | <i>Reduction (Percent)</i> |
|----------|----------------------------|
| FEV1 | 20 |
| FVC | 10 |
| FEF25-75 | 25 |
| Sgaw | 40 |

sionally results in localized wheezing. An opening snap of mitral stenosis may indicate left atrial enlargement with bronchial deformation or pulmonary congestion. Peripheral adenopathy may suggest granulomatous or neoplastic disease. Goiter or cervical tenderness may reflect thyroid pathology. Otolaryngology consultation may obviate invasive diagnostic testing if laryngeal pathology is identified.

The Chest Radiograph

An abnormal chest radiograph usually mandates prompt referral and removes the patient from the category of unexplained cough. Patients with asthma and chronic rhinosinusitis usually have normal radiographs, as do patients with esophageal reflux.⁽⁹⁾ Roughly 10 percent of patients with interstitial lung disease have normal lung shadows. The physician should carefully search for subtle calcific adenopathy producing broncholiths eroding into central airways, for tracheobronchial narrowing seen with neoplasms, or regional hyperinflation distal to a central obstruction. Cardiomegaly, interstitial edema, and vascular redistribution usually indicates a cardiac etiology. Patients with suspicion of sinus disease warrant sinus films.

Spirometry

In assessing chronic cough, the physician should utilize spirometry early in the evaluation. Irwin⁽¹⁰⁾ and Poe⁽¹¹⁾ have shown the high incidence of airflow obstruction and bronchial hyperreactivity in this population. In patients in whom spirometry is normal and cough persistent, methacholine inhalation may unmask airflow obstruction (diagnostic criteria are listed in Table 3) and reproduce patients' symptoms. False positives may occur, however, in 50 percent of patients with chronic allergic rhinitis. Assessment of the flow-volume loop may detect upper airway obstruction (flattening of the inspiratory limb may be seen with extrathoracic obstruction, sometimes seen with chronic postnasal drainage or other laryngeal pathology).

TABLE 4
Empiric Therapy for Cough

| |
|---|
| Smoking cessation |
| Withdrawal of potentially offending medications |
| Aerosol bronchodilator |
| Decongestants |
| Antihistamine-sympathomimetic agents |
| Intranasal corticosteroids |
| Centrally-acting antitussives |
| Codeine |
| Dextromethorphan (found in combination with other agents) |
| Peripheral antitussives |
| Benzonatate |

Empiric Treatment

The clinical evaluation, chest radiograph, and spirometry can usually be completed during the initial visit. Since methacholine inhalation may not be readily available, a trial of empiric treatment is often reasonable until a specific diagnosis (or diagnoses in some instances) is made (Table 4). Smoking cessation is always recommended. Half of patients who derive symptomatic benefit do so within the first month.⁽¹²⁾

Because of the preponderance of asthma, postinfectious bronchial hyperreactivity, and chronic postnasal drainage seen with chronic cough, aerosol bronchodilator therapy and consideration of antihistamines (which also have antitussive effects) or possibly intranasal corticosteroids is logical. For patients with pyrosis (heartburn), a trial of antireflux therapy is initiated. Obviously, unless absolutely essential, potentially causal medications should be withdrawn. Provision of a supply of codeine may allow the patient to get some much needed sleep or pain relief if cough fractures have supervened. Some patients benefit from dextromethorphan, the d isomer of the codeine analog of levorphanol, a centrally-acting agent found in numerous over-the-counter cough preparations. I have yet to see patients benefit from benzonatate (Tessalon) and guaifenesin at conventional doses has little literature support to command its use.

Supplemental Diagnostic Studies

Because of the myriad of diagnostic considerations, many further diagnostic investigations are possible. I prefer to assess the results of empiric therapy before subjecting patients to invasive or expensive testing. Although psychogenic cough is a diagnosis of exclusion, it should be

TABLE 5
Clinical Studies Assessing Diagnosis and Management of Chronic Cough

| <i>Study</i> | <i>Subjects</i> | <i>Diagnosis (Percent)</i> | <i>Successful Therapy (Percent)</i> |
|-------------------------------|-----------------|--------------------------------|---|
| Irwin (1981) ¹⁰ | 49 | 100 | 97 |
| Poe (1982) ¹¹ | 109 | 97 | 93 |
| Holinger (1986) ¹⁶ | 38 | 87 | 87 |
| Irwin (1988) ¹⁷ | 102 | 99 | 98 |
| Poe (1989) ¹⁸ | 139 | 88 | 93 |

considered,⁽¹³⁾ particularly when invasive procedures or potentially harmful treatment is prescribed. In patients who continue to cough, bronchoscopy is recommended.

Over a quarter of highly selected patients (with normal chest radiographs in whom empiric therapy had failed) had diagnostic bronchoscopic examinations at the National Naval Medical Center, Bethesda, MD (unpublished data), including broncholithiasis, tracheobronchopathia osteochondroplastica, and tuberculous bronchostenosis. Twenty-four esophageal pH monitoring may disclose clinically silent gastroesophageal reflux (absence of pyrosis or abnormal esophagram).

Irwin diagnosed unsuspected thyroiditis, suppressible with anti-inflammatory agents and thyroxine in two patients with thyroid scintigraphy.⁽¹⁴⁾ Irwin has reported consistent diagnostic success and therapeutic success in 98 percent and 97 percent at 4 and 18 months of followup.⁽¹⁰⁾ A summary of recent studies evaluating the diagnosis and management of chronic cough is presented in Table 5.

Summary

The patient with persistent cough represents a formidable challenge in daily practice. Although most patients have either unsuspected airflow obstruction and/or chronic rhinosinusitis, most patients are capably managed with clinical evaluation, chest radiographs, spirometry, and thoughtful use of empiric therapy. The patient with chronic cough infrequently requires invasive diagnostic evaluation, although this too may be rewarding. Even when the precise etiology of cough remains elusive, physicians and patients benefit from the relief available with nonspecific antitussive therapy for palliation of symptoms.

References

1. Braman SS, Corrao WM: Cough: Differential diagnosis and treatment. *Clin Chest Med* 8:177-188, 1987.
2. McCool FD, Leith DE: Pathophysiology of cough. *Clin Chest Med* 8:189-195, 1987.
3. Wynder EL, Lemon FR, Mantel N: Epidemiology of persistent

cough. *Am Rev Respir Dis* 91:679, 1965.

4. Empey DW, Laitenen LA, Jacobs L, Gold WM, Nadel JA: Mechanisms of bronchial hyperreactivity in normal subjects after upper respiratory infection. *Am Rev Respir Dis* 113:131-139, 1976.

5. Irwin RS, Pratter MR, Holland PS, Corwin RW, Hughes JP: Postnasal drip causes cough and is associated with reversible upper airway obstruction. *Chest* 85:346-352, 1984.

6. Corrao WM, Branam SS, Irwin RS: Chronic cough as the sole presenting manifestation of bronchial asthma. *N Engl J Med* 300:633, 1979.

7. Kaufman J, Casanova JE, Riendl P, Schlueter DP: Bronchial hyperreactivity and cough due to angiotensin-converting enzyme inhibitors. *Chest* 95:544-548, 1989.

8. Cooper JAD, Matthay RA: Drug-induced pulmonary disease. *Disease-A-Month* 33(2):61-120, 1987.

9. Brashear RE: Cough: Diagnostic considerations with normal chest roentgenograms. *J Fam Pract* 15:979-985, 1982.

10. Irwin RS, Corrao WM, Pratter MR: Chronic persistent cough in the adult: The spectrum and frequency of causes and successful outcome of specific therapy. *Am Rev Respir Dis* 123:413-417, 1981.

11. Poe RH, Israel RH, Utell MJ, Hall WJ: Chronic cough: Bronchoscopy or pulmonary function testing? *Am Rev Respir Dis* 126:160-162, 1982.

12. Wynder EL, Kaufman PL, Lesser RL: A short-term followup study on ex-cigarette smokers. *Am Rev Respir Dis* 96:645, 1967.

13. Banyai AL: A symptom connoting many causes and sequels. *Chest* 60:355, 1971.

14. Irwin RS, Pratter MR, Hamolsky MW: Chronic persistent cough. An uncommon presenting complaint of thyroiditis. *Chest* 81:386, 1982.

15. American thoracic subcommittee statement on bronchial inhalation challenges. *Am Thorac Soc News*, Spring 1980, pp 11-19.

16. Holinger LD: Chronic cough in infants and children. *Laryngoscope* 96:316-322, 1986.

17. Irwin RS, Curley FJ, French CL: Chronic persistent cough: The spectrum and frequency of causes, key components of the diagnostic evaluation, and outcomes of specific therapy in 1987. *Am Rev Respir Dis* 137(suppl):161, 1988.

18. Poe RH, Harder RV, Israel RH, Kallay MC: Chronic persistent cough. Experience in diagnosis and outcome using an anatomic diagnostic protocol. *Chest* 95:723-728, 1989. □

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In Memoriam

CAPT **David J. LeTourneau**, MC, Director, Readiness Division, Naval Medical Command, Washington, DC, since August 1988, died 6 June 1989.

CAPT LeTourneau was born in Meriden, CT, on 3 June 1932. After receiving an A.B. degree from Wesleyan College in 1954, he attended Tufts University School of Medicine, receiving his M.D. degree in 1959.

Commissioned as a lieutenant in the Naval Reserve, he entered the School of Aviation Medicine at Pensacola in 1960 and was designated a flight surgeon in December of that year. He served as assistant senior medical officer at NAS Miramar from December 1962 to June 1963.

Following 8 years of private practice, CAPT LeTourneau returned to active duty in August 1971 as a commander. After training in aerospace medicine, he received a M.P.H. from Tulane University in May 1972. The next 2 years were spent at the Naval Aerospace Medical Institute where he participated in Operation Homecoming and Skylab II. In 1974 he was ordered to USS *Saratoga* as senior medical officer. He was promoted to captain in 1976 and ordered to NAS South Weymouth as senior medical officer. From August 1979 through July 1983 he served as Force Medical Officer for COMNAVAIRLANT. In August 1983 he attended the Industrial College of the Armed Forces, graduating in June 1984. Upon graduation, he was assigned as Sixth Fleet Medical Officer, where he served until August 1988.

CAPT LeTourneau was posthumously awarded the Legion of Merit.

SCAMC Symposium

The 13th Annual Symposium on Computer Applications in Medical Care (SCAMC) will be held 5-8 Nov 1989 at the Sheraton Washington Hotel, Washington, DC. The symposium provides a forum for professionals from across the broad spectrum of medical informatics areas to come together to listen, exchange ideas, and acquire new insights for solving health care computing problems.

For more information contact: SCAMC—Office of Continuing Medical Education, The George Washington University Medical Center, 2300 K Street, NW, Washington, DC 20037. Telephone: Commercial (202) 994-8928.

Military Medicine Conference— Call for Abstracts

The Fifth Annual Conference on Military Medicine will be held 5-6 Oct 1989 at the Uniformed Services University of the Health Sciences in Bethesda, MD. The theme will be "Health Promotion for Maximum Readiness." Abstracts for poster presentations on the theme as well as on general topics in military medicine are requested.

Submit original abstracts of no more than 250 words and three copies, including a current curriculum vitae to: Deborah Gardner, Conference Coordinator, Room C1024, 4301 Jones Bridge Road, Bethesda, MD 20814-4799. Please indicate your name, rank, correct title, complete military or business address, and telephone number at the top of your abstract. Poster displays should be no larger than 6 feet long by 4 feet wide. Deadline for submission of abstracts is 1 Sept 1989.

Naval Dental Officer Symposium

The 29th Naval Dental Officer Symposium and luncheon will meet 11-12 Feb 1990 at the Westin Hotel, North Michigan Avenue, Chicago, IL.

The one-day symposium will be held in conjunction with the annual Chicago Midwinter Dental Meeting, one of the largest civilian dental conferences in the nation. The symposium is open to all active duty, selected reserve, and retired dental officers.

The agenda will focus on a wide range of important topics of interest to all naval dental personnel. A luncheon at the hotel will follow 12 Feb.

Active duty and retired personnel interested in attending should write: CDR (Sel) David A. Glass, Naval Dental Clinic, NTC Great Lakes, IL 60088. Telephone: Commercial (312) 688-3620, Autovon 792-3620.

Selected reserve and retired dentists are asked to contact: CAPT (Sel) Steven D. Miller, 10 Philip Road, Suite 113, Vernon Hills, IL 60061. Telephone: Commercial (312) 367-9330.

To the Editor

In your May-June 1989 issue of *Navy Medicine* the article, "We Teach Caring" erroneously noted the 8404 and 8707 NEC's were the responsibility of HSETC. This is not the case.

The Field Medical Service Schools at Camp Lejeune and Camp Pendleton are formal Marine Corps schools responsible to the Commanding General Marine Corps Base and HQMC. The program for instruction for the Basic Field Medical Technic course is approved by the Marine Corps Combat Development Center. The Medical Officer of the Marine Corps and his staff provide liaison to MEDCOM and HSETC on medical matters.

By the way "we teach caring" as well to our combat corpsmen and dental techs as they prepare themselves in those medical, defensive combat, and physical readiness areas necessary for assignment to the FMF.

CAPT J.M. Lamdin, MSC
CO, FMSS
Camp Lejeune, NC

Highlights From the Navy Medical Research and Development Command

Bethesda, MD

• HIV-1 Infection Inactivates an Important Receptor on T-Lymphocytes

To allow the development of improved therapies for Navy casualties suffering from immune system injury, researchers at the Naval Medical Research Institute, Bethesda, MD, are studying the mechanisms of immune cell activation and regulation. In collaborative studies with scientists at the Georgetown University, Washington, DC, and the Oncogen Corp., Seattle, WA, investigators have reported a specific defect in the activation pathway of T-lymphocytes infected with the Human Immunodeficiency Virus (HIV-1). Unlike normal lymphocytes, which both increase internal levels of calcium

and proliferate after monoclonal antibody stimulation of cell surface receptors (CD2 and CD3), HIV-1-infected cells were shown to be unable to concentrate calcium and to replicate only poorly after stimulation with anti-CD3. The lesion appeared to be specific to the CD3 receptor, as the cells retained their responsiveness to stimulation with both anti-CD2 and interleukin-2. These results show that a signaling defect of the T-lymphocyte CD3 receptor may be part of the biochemical mechanism causing the profound immunodeficiency of patients with HIV-1 infection.

* * *

• Ice Vests Used to Cool Persian Gulf Sailors

Deployed Navy personnel can be operationally exposed to high environmental temperatures and humidity, resulting in heat stress and reduced job performance. In conjunction with scientists at the Navy Clothing and Textile Research Facility, Natick, MA, researchers from the Naval Health Research Center (NHRC), San Diego, CA, have conducted field tests in the Persian Gulf which showed that the use of a "cooling vest" (a cloth vest that carries 6-8 ice packs within its inner pockets) by both engineering room and helicopter

aircrew personnel helped maintain normal physiology (heart rate and body/skin temperature) and relative comfort (levels of heat stress and fatigue) during extended operational duties. The use of cooling vests may ultimately allow for extending the current standards which restrict the length of time sailors can work safely in hot operational environments. Additional testing of this possibility is being done by NHRC researchers during July and August this year.

* * *

• Type A and Type B Red Blood Cells Can Now Be Converted to Type O

The enzymatic conversion of red blood cells will permit donor red blood cells of any type to be safely transfused into any recipient, eliminating the need for typing and crossmatching and augmenting the speed and availability of blood for combat-injured Navy personnel. The enzyme-based conversion of red blood cells has been demonstrated to remove successfully the carbohydrate red blood cell surface molecules responsible for conferring blood type. The specific enzymes used to remove the A and B antigens do not harm the integrity or function of the red blood cells. Studies have demon-

strated that enzymatically converted red blood cells can be safely transfused into the recipients for whom the blood, prior to enzymatic conversion, would have been incompatible. This Navy-funded research has been carried out at the Lindsley F. Kimball Research Institute of The New York Blood Center, New York, NY. Broader clinical trials will be beginning in several months.

For additional information on these or other medical R&D projects, contact NMRDC Code 40 at Commercial (202) 295-1468 or Autovon 295-1468.

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